



Memorandum

Date: 10 October 2017

From: Michael C. Maguire
Vector Launch

FRN 0026456863

FCC File Number: 1201-EX-ST-2017

To: Leann Nguyen, FCC – OET
Jeanette Spriggs, FCC – OET

Subject: Vector Launch Inc. Experimental STA Application for
Vector-R Series B0.00X Launch Vehicles

Reference Documents:

REF1 FCC, DA-13-446, Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities, 15 March 2013.

REF2 GN-022-VSS-NEW, Vector Memo Experimental STA Application B0.00X (this document)

REF3 GN-024-VSS-NEW, Vector Supporting Material Experimental STA Application B0.00X

This memorandum provides backup data for the Experimental STA Application for the Vector-R B0.00X series launch vehicles being developed by Vector Launch Inc of Tucson AZ. This STA request follows the application guidelines DA-13-446 Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities (REF1). Vector Launch Inc is developing the Vector-R as a small, low cost, launch vehicle to serve the commercial small satellite market. A spreadsheet providing tabulated values of mission parameters is provided in REF3 also attached to this application.

This application will cover only the Vector-R B0.00X series. The Vector-R B0.00X vehicles are low altitude test launches required to develop the orbital launch capable Vector-R B0.X series. Separate STA applications will be submitted for the Vector-R B0.X series.

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GN-0222-VSS-NEW

A brief summary of Vector-R B0.00X series launches follow; detailed technical data for the B0.00X series is contained in GN-0224-VSS-NEW (REF3) attached.

Launch Date	Vehicle	Launch Site	Comment
January 2018	B0.003	Randsburg (Mojave) CA	Planned
March 2018	B0.004	Randsburg (Mojave) CA	Additional launch opportunity TBD
April 2018	B0.005	Randsburg (Mojave) CA	Additional launch opportunity TBD
May 2018	B0.006	Randsburg (Mojave) CA	Additional launch opportunity TBD

The Randsburg launch site is located at 35.348°N, -117.810°W, and at an altitude of 1070 m. The test vehicle will not exceed 10000 ft (3048 m) above the launch site.

The Experimental STA application requests four telemetry downlinks in the 2200 to 2300 MHz S-Band. This band is allocated for government use however the allocation is regularly used for commercial launch vehicles, such as SpaceX, on a case-by-case basis. Vector requests use of this band on a non-interference basis.

This application is for the Vector launch vehicle. The launch vehicle maximum flight duration will be less than 5 minutes. Pre-flight transmitter operation is expected to be less than 30 minutes. The maximum operating time is expected to be less than 90 minutes from the commencement of launch activities. This is an absolute worst-case estimate as operating longer than 30 to 60 minutes may require shut down of the transmitters due to thermal concerns.

Four downlink frequencies have been arbitrarily chosen; these can be adjusted within the requested band as necessary to avoid other users. The four downlinks are planned as a worst case; one or more of the links may not be used for each mission.

	Frequency	Modulation	Data Rate	Emission Designator	Use
Link 1	2213.5 MHz	SOQPSK	128 kbps	118KG1DCT	1 st Stage Telemetry
Link 2	2231.5 MHz	SOQPSK	256 kbps	233KG1DCT	2 nd Stage Telemetry
Link 3	2251.5 MHz	SOQPSK	5000 kbps	4M48G1DCT	HD Digital Video
Link 4	2273.5 MHz	FM/NTSC	525 line	5M75F8FNN	NTSC Analog Video

Antenna registration is provided for 4 antennas; 2 different types of transmitters are specified.

The first transmitter type is a Quasonix nanoTX™; this is a Commercial-Off-The-Shelf (COTS) telemetry transmitter used extensively throughout the aerospace and space industries. The Quasonix unit employs Shaped Offset Quadrature Phase Shift Key (SOQPSK) modulation to provide highly efficient bandwidth utilization at data rates up to 46 Mbps. In the Vector application 3 data rates are indicated: 128 kbps, 256 kbps, and 5000 kbps. These will be used for low-rate digital telemetry, high-rate digital telemetry, and digital video respectively.

Note: not all digital telemetry streams will be used on all launches, extra transmitters are provided should Vector require them for future flights.

The second transmitter type is an Emhiser EVTC-09E1A203-00 Channelized Video Transmitter; this is a COTS, analog, video transmitter used extensively throughout the aerospace and space industry.

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The Emhiser unit uses FM/NTSC modulation to provide downlink, analog, video from an onboard camera.

Note: the analog video downlink is unlikely to be used but is included should Vector be unable to prepare an HD video link for these launches. The digital HD video links would be transmitted using the 5000 kbps link described under the nanoTX™ section above.

The antennas on the launch vehicle are omnidirectional. All downlinks will be split to two hemispherical antennas located on either side of the launch vehicle to create an omnidirectional antenna pattern. All antennas are right hand circularly polarized.

The antenna height will vary from 5 m off the ground while on the launch pad to approximately 3000 m (10000 ft) altitude.

Please contact me as soon as possible should additional information be required.

Thank you,

Mike

Michael C. Maguire

Vector Launch Inc.
824 E 16th Street
Tucson AZ 85719

mike.maguire@vector-launch.com
+1 (626) 676 7230

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